Flight Deck Lighting Addressable Smart Control Modules

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The official link for this solicitation is:
http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml

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Description:
Surface aviation and amphibious assault ships launch and recover aircraft whose pilots typically use Night Vision Devices (NVDs) for night operations. As a result, the NVD flight deck lighting solution requires control and dimming of various individual lighting fixtures and circuits aboard these ships. Digitally addressable control of these lighting fixtures is required in order to dim and/or turn these lights on and off depending on what the flight operations and atmospheric conditions require. The US Navy desires a new solution for aviation lighting aboard air capable ships utilizing LED technology through a standardized smart module that will be able to recognize the lighting package configuration and what type of fixture it is controlling through embedded firmware/software; this would allow lights of different functions and power requirements to be daisy chained, significantly reducing cable runs and installation costs. As lights are added to the system, they should self-configure and appear on the operator control panel in the correct lighting group. The smart module would eliminate the need for multiple configurations, set-up issues and complex troubleshooting while providing a simplified configuration that allows it to be easily replaced when a light is not able to be turned on/off, dimmed, or flashed from the operator control panel. Failures of any light should not affect the operation of any other light. The existing lighting control system includes an expensive (estimated $60,000) electronics box, FLEXDRIVER, which drives up to forty-eight light fixtures on a ship in each enclosure; this reduces system reliability and creates single point failures. A large ship may need in excess of twelve FLEXDRIVER’s, each of which must be individually configured for the compliment of lights the flight deck has. Each configuration is a unique mix of multiple driver cards for the specific light fixtures it drives and each light has a direct connection to a FLEXDRIVER,

increasing system cabling. An innovative approach is needed to identify the most cost effective methods to achieve successful installation of the smart module. Objectives to consider include the ability to reduce the system cable plant, minimize system interconnections, provide redundancy for fault tolerance, provide for on/off, flashing and dimming control of various lighting groups, configurations that can be incorporated into existing lighting fixtures or interconnection junction boxes while minimizing total system cost of ownership. The consolidated control of the total system would be over the shipboard Local Area Network (LAN). The proposed system should meet strict Electro Magnetic Interference (EMI) requirements of Mil-STD-461 and navy shipboard environmental requirements. Of note, there are twelve different LED lighting fixtures of varying quantities that make up the Advanced Flight Deck Lighting (AFDL) system. More will be developed in the future. Current lighting fixtures range from a single LED fixture to fixtures containing multiple LED strings (1-6) with different voltage (3-28VDC) and current (68-3150ma) requirements. PHASE I: Design and demonstrate the feasibility of a universal smart LED Light Fixture Control module, as discussed in the Description section, with respective embedded firmware/software capable of having universal applications on all US Navy flight decks while identifying methods to keep overall system costs to a minimum. PHASE II: Based on the Phase I effort develop a production-representative prototype of an LED Light Fixture Control smart module and demonstrate its functionality in a lighting control system on a shipboard representative lighting layout with either real or simulated loads, provided by NAVAIR (e.g., either a test bench or real fixtures at NAVAIR Lakehurst or a location to be determined (TBD)). Design concepts should be updated to detailed design documentation. Analysis of shipboard environmental sustainability should be provided at a minimum, with environmental testing of the PRM conducted ideally. The ability to provide a failure analysis is desired, as is an estimate of service life. PHASE III: Finalize development of an optimized LED Light Fixture Control smart module design for robustness and full environmental qualification, including shock testing. Test prototype in conjunction with a shipboard representative flight deck lighting system (TBD by NAVAIR). Produce units for delivery to fleet and shore sites. Transition and integrate the smart module into its intended platform(s).